VULNERABILITY OF NATIONAL ENERGY DISTRIBUTION SYSTEMS

HEARING

BEFORE THE

SUBCOMMITTEE ON ENERGY, ENVIRONMENT, AND SAFETY ISSUES AFFECTING SMALL BUSINESS

OF THE

COMMITTEE ON SMALL BUSINESS HOUSE OF REPRESENTATIVES

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VULNERABILITY OF NATIONAL ENERGY DISTRIBUTION SYSTEMS

TUESDAY, MAY 18, 1982

HOUSE OF REPRESENTATIVES, SUBCOMMITTEE ON ENERGY, ENVIRONMENT, AND SAFETY ISSUES AFFECTING SMALL BUSINESS, COMMITTEE ON SMALL BUSINESS,

Washington, D.C.

The subcommittee met, pursuant to notice, at 9:30 a.m., in room 2359-A, Rayburn House Office Building, Hon. Berkley Bedell (chairman of the subcommittee) presiding.

OPENING STATEMENT OF CHAIRMAN BEDELL

Mr. BEDELL. The subcommittee will come to order.

This morning the House Small Business Subcommittee on Energy, Environment, and Safety Issues Affecting Small Business meets to consider the issue of possible disruptions to our Nation's energy distribution system and the implications of this for the small business community.

Because of the widespread interest in this very important subject we have invited members from other committees to sit with us this morning and we are pleased to welcome Congressman Chappie this morning.

We have in the United States an economy which is highly advanced technologically and which is also highly dependent on reliable energy supplies.

If the flow of energy to any part of the economy is disrupted, then serious problems arise. We saw this most recently when the collapse of the Shah's government in Iran triggered serious petroleum supply problems in this country in 1979.

It is the chairman's opinion that small businesses and agricultural enterprises are particularly vulnerable to injury from energy supply disruptions, because they exist at the end of the energy distribution system.

But, at the same time, they have the greatest potential for reducing their dependence on centralized energy systems and thereby reducing their vulnerability.

I, for one, do not see how we can focus so much attention on national security, and then turn a blind eye to the issue of energy vulnerability.

Does it really make any sense to focus attention on the impossible task of surviving a nuclear holocaust while ignoring the immediate threat of natural or manmade disruptions of the energy system that sustains our society?

What is particularly frustrating, of course, is that we know what can be done to resolve the energy vulnerability problem, and yet we seem to be headed in exactly the wrong direction.

Our hearing this morning is intended to explore the nature and the dimensions of our energy vulnerability problem, to consider its implications for the small business community in particular, and to consider some of the actions that can be taken in response to the problem.

As we have learned from experience, we can ignore energy issues only at the risk of having them come back to grab our attention in a very dramatic way in the future.

We have a distinguished group of witnesses scheduled to testify this morning. They come from a variety of backgrounds and each is a nationally recognized expert.

I understand that the testimony we will hear this morning includes the findings of several studies that have never before been discussed in public hearings. We are pleased to provide a forum for the discussion of the serious issues raised by these studies.

Another meeting is scheduled to be held in this room early this afternoon, so we must adjourn by 12 o'clock. To give everyone a chance to be heard in an orderly fashion, we will group our witnesses into two panels. Each witness will have about 10 minutes to make an individual presentation, and then questions will be addressed to the panels.

Our first witnesses this morning will be Amory and Hunter Lovins, the authors of a new book, "Brittle Power: Energy Strategy for National Security," and Patrick Heffernan, a consultant to the California Energy Commission's Contingency Planning Committee.

The book is based upon a study they did recently for the Federal Emergency Management Agency, and Mr. Heffernan has been involved with an important study recently completed by the Rand Corporation.

We also have on that panel Dr. Robert Kupperman, the executive director of Georgetown University's Center for Strategic and International Studies.

He is a noted authority on the subject of international terrorist activity and was in charge of the Reagan administration's transition team at FEMA.

On our second panel, we have Herman Director, the chief economist of the National Small Business Association and the former Chief of Systems Planning for the War Production Board. He has been actively involved in emergency preparedness planning in eight administrations, including the present one.

Also on the second panel is David Pomerantz, the director of the energy management project at the International City Management Association. He has been cited for his work in planning greater energy independence for communities in Massachusetts and elsewhere.

Mr. Mavroules, I understand you have a statement.

OPENING STATEMENT OF HON. NICHOLAS MAVROULES, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF MASSACHUSETTS

Mr. MAVROULES. I do, Mr. Chairman.

Thank you for this opportunity to comment on the resource that we have which could alleviate our problem, at least to some degree.

As we all know, America's lifeline, and its Achilles' heel, is oil. There is no more serious threat to the long term economic and military security of this country than that which stems from the growing deficiency of secure and assured energy resources.

The 1973 Arab oil embargo alerted us all to the vulnerability of our dependence on petroleum products.

This dependence forces us to face some harsh realities: Namely, that new oil discoveries will continue to be less, world competition for existing oil in the ground will increase; and as oil resources are depleted, the quality of oil also will decrease.

Unfortunately, the United States may find itself incapable of systematically responding in the face of any major disruption of our oil supply. What makes our dependence even more precarious is the Department of Defense's highly vulnerable energy logistics tail.

Like the Nation at large, DOD relies heavily on oil. Mainly because of the demand by aircraft and ships, some 81 percent of DOD's total energy needs must be met by petroleum products.

Our military operations hinge largely on the fuel supplied by nonmilitary producers. Oil extracted from the ground must move through refiners, storage facilities and in many instances, private sector suppliers.

It is a plumbing system of organization and construction that is highly vulnerable to disruption or sabotage during a state of military emergency.

Furthermore, while DOD has fuel caches all over the world, their locations are public information, making them easy targets for sabotage.

Although it is true our national policy dictates that we rely solely on domestically produced oil during a national war emergency, a carefully targeted hostile MIRV missile attack could destroy in seconds about 65 percent of our refining capability.

Our colleagues on the Armed Services Committee have recognized this problem, and have incorporated a bill I introduced, the Department of Defense Renewable Energy Utilization Act, into the military installations appropriations bill.

This act would promote the energy self-sufficiency of our military, by allowing DOD to procure photovoltaic systems and other renewable forms of energy wherever cost effective and applicable.

Photovoltaic systems today are less expensive, on a life cycle basis, than small diesels, primarily batteries, and thermoelectric systems. All fuel costs—that is, sunlight—are free, and maintenance and operations costs are reduced to an occasional cleaning of the panels in dusty areas.

Furthermore, these systems are silent and are not subject to any vulnerability in the fuel supply link. They already have been successfully applied in the most remote and hostile environments.

This could do for photovoltaics and other renewable technologies what the space program did for the semiconductor industry. It will accelerate the progress of making these technologies widely acceptable and cost competitive in the commercial, private sector.

Americans have the right to demand that the Pentagon use its economic power to help solve those domestic problems, such as promoting energy self-sufficiency, which are important to our total national security.

Thank you for this opportunity, Mr. Chairman.

Mr. BEDELL. Thank you, Mr. Mavroules, and we appreciate your leadership in this area.

Mr. Chappie.

OPENING STATEMENT OF HON. GENE CHAPPIE, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF CALIFORNIA

Mr. CHAPPIE. Thank you, Mr. Chairman.

I want to thank you for the opportunity to voice my concern over America's ability to deal with a major disruption of her energy lifeline.

I think we were all shocked by the impact of the Arab oil embargo and there is every indication that a similar import slowdown today would again throw our Nation into an economic panic.

Although ideally I believe all resources should be allocated by price, we cannot ignore the fact that certain sectors of our economy are hit harder by drastic fluctuations in price.

In my district, agricultural interests, especially rice farmers, are forced to shoulder a disproportionate share of the burden during a national energy emergency.

I applaud the members of this committee for their efforts to promote a more systematic approach to resource allocation in times of national emergency. Our economy is so interdependent, America cannot afford to be caught short and unprepared again.

Thank you very much.

Mr. BEDELL. Thank you very much, Mr. Chappie.

Our first two witnesses, then, will be Amory and Hunter Lovins. We appreciate very much your coming down for this hearing. Who will be first?

PANEL CONSISTING OF AMORY B. LOVINS; MRS. L. HUNTER LOVINS; PATRICK H. HEFFERNAN; AND ROBERT KUPPERMAN

TESTIMONY OF AMORY B. LOVINS AND MRS. L. HUNTER LOVINS, ENERGY POLICY CONSULTANTS

Mr. LOVINS. Thank you, Mr. Chairman.

Over many decades, the United States has gradually built up an energy system that is extremely brittle—easily shattered by accident or malice. The mission of our Armed Forces has been systematically undermined by civilian energy decisions that now make it possible for a handful of people to turn off the whole country. A few people could shut off three-quarters of the natural gas supply to the Eastern States in one evening without even leaving Louisiana. Domestic oil systems are at least as vulnerable. Electric grids are even more so.

This grave and growing threat to national security comes not from hostile ideology but from misapplied technology. It is not a threat imposed on us by enemies abroad. It is a threat we have heedlessly—and needlessly—imposed on ourselves. It arises essentially from the centralization and complexity of our energy conversion and distribution technologies. Piece by piece, we have unthinkingly assembled them in such a pattern that regional and national energy systems are prone to sudden, massive failures with catastrophic consequences.

Energy vulnerability poses more than a military threat. It is also a political threat. Any vulnerability which greatly alters the power balance between large and small groups in society can erode the liberties and the trust that underpin constitutional government. Energy vulnerability also threatens the economy—most of all the viability of small business, which is likely to be hit hardest by energy shortages, energy price jumps, or capital shortages.

Yet, as we shall suggest, small business is also a key part of the solution. For there *is* a solution to our comprehensive energy brittleness. Available, cost-effective technologies, organized on different principles than in the past, can actually make major failures of energy supply impossible, meet all the energy needs of a dynamic economy, and save Americans trillions of dollars.

As a result of briefings in the Joint Chiefs' office and the National Defense University, we were commissioned in 1979 by the Defense Civil Preparedness Agency to analyze in depth how and why America's energy system is vulnerable, and how to design an invulnerable, resilient system. The resulting study [1] was released last November by that Agency's successor, the Federal Emergency Management Agency. An updated version rewritten for a lay audience will be published this Friday, entitled "Brittle Power: Energy Strategy for National Security." [2]

In analyzing energy vulnerabilities, it is essential not to offer the malicious a cookbook. We have been careful to provide a level of specificity which would be too little to help people who were not already skilled enough to mount an effective attack, but superfluous to those who were. To check our own judgment of what was discreet, we asked more than 50 reviewers in industry, government, the Armed Forces, and universities to identify any material they felt should be omitted. No such material was identified. The official version of our work also underwent formal classification review before being released for unlimited distribution.

Despite these precautions, some residual risk of giving people nasty ideas remains—the price of informed policy debate in an open society. We believe, however, that the only thing more dangerous than discussing these distressing matters is not discussing them, and thus by silence collaborating in the rapid increase of energy vulnerability.

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[1] A. B. & L. H. Lovins, "Energy Policies for Resilience and National Security," Final Report to CEQ (Contract No. EQ9AC016) for FEMA (Contract No. DCPA 01-79-C-0317), FEMA Work Unit 4351C, DTIC Accession No. A108263, released November 13, 1981, by the Federal Emergency Management Agency, Washington, D.C. 20472.

[2] Brick House Publishing Co. (34 Essex St., Andover Mass. 01810), May 21, 1982, ISBN 0-931790-28-X, $17.95. Foreword by Admiral Thomas H. Moorer (U.S.N. Ret.) [Chairman of the Joint Chiefs of Staff under President Nixon] and Hon. R. James Woolsey [Undersecretary of the Navy in the Carter Administration].

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That course seems to us irresponsible, for terrorists are already exploiting energy vulnerability in weekly attacks around the world. We have documented significant recent assaults on centralized energy systems in upwards of 26 States and 40 foreign countries. These attacks are becoming more frequent and more serious. We therefore felt it was time that the public and political leaders also found out about energy vulnerability—and how to prevent it.

How did our Nation get into this fix? Through prolonged inattention. A century ago, the United States shifted from wood to coal in search of more secure and abundant fuel. After the 1919 coal strike we shifted anew to oil and gas—now three-quarters of our energy. Transportation problems in World War II led us to shift from coastal oil tankers and coal trains to oil and gas pipelines. The 1973 Arab oil embargo encouraged a greater emphasis on coal-fired and nuclear power stations which were hoped to substitute for foreign oil. The 1979 Iranian revolution sparked a synfuels program. But in each case, an overly narrow definition of energy vulnerability led us merely to substitute one fragility for another. Even now, most analysts define energy security to be the ability either to keep a line of tankers arriving from the Persian Gulf or to substitute any domestic energy source, with no regard for any vulnerabilities it might have. As a result, most Federal programs meant to reduce energy insecurity have actually increased it, in ways that are more subtle and less tractable.

The oil-import problem is real and urgent. It is also soluble: Just raising the efficiency of buildings and cars could more than eliminate U.S. oil imports within this decade, before a powerplant or synfuel plant ordered now could deliver any energy whatever, and at a tenth of its cost. But oil is more than imported oil; energy is more than oil; and energy security is far more than ability to keep the oil coming. Thus even zero oil imports would barely begin to reduce America's total inventory of critical energy chokepoints.

For example, the loss of three major domestic oil pipelines—each of which could be knocked out for more than a year by one skilled person—could be more serious than a complete cutoff of oil imports. It would not take more than a few people to black out, for months to years, any of our Nation's three regional electric grids. Certain attacks on natural gas systems could incinerate a city. A few people, perhaps one person, could release enough radioactivity from certain nuclear facilities to make a substantial part of the country uninhabitable for centuries. Further, any of these things, and more, could happen simply by accident, in ways that no technologist can predict.

Our analysis first considers how natural disasters, deliberate actions, and technical accidents can disrupt energy supplies. Most modern energy systems are so complex that nobody can foresee the almost infinitely many ways in which they might fail—perhaps aided by human error or intention. The resulting high-technology surprises can defeat even the most careful engineering. Engineers design energy systems to be technically reliable in the face of calculable, predictable kinds of failures. But such reliability does not make the energy system resilient against incalculable unforeseeable kinds of failures, and may even make such failures more likely—while giving us a false sense of security.

Thus a power engineer's normal response to a blackout might be to redesign the relays which caused it, so that substantially identical kinds of blackouts will happen less often. But such a cosmetic response does not alter the architecture of the energy system so as to make massive failures impossible or inconsequential. The features that now make our fuel and power distribution systems inherently vulnerable to collapse include: Hauling fuel and power for hundreds or thousands of miles from centralized sources; the stringent requirement of continuity and synchronism in electric and gas grids; limited substitutability between fuels; limited flexibility in delivery systems; very capital-intensive devices with long times and limited public acceptance; delicate control and communication systems; highly specialized skills; reliance of supposedly independent energy systems on each other; and the possibility of adding noxious materials to fuel distribution systems. No energy system with these features can survive a surprise-full future. Worse, if big failures do occur, they can be difficult or impossible to repair, because major spare parts are seldom stocked and take months or years to make. Repairs often need special equipment and skills which, in any emergency, may be in very short supply.

The first third of our analysis discusses these matters generically, with case-studies including the 1977 New York blackout and military attacks on energy systems. The second part focuses specifically on liquefied energy gases, the oil and gas system, nuclear systems, and central-electric grids. This section concludes that bipartisan Federal policy—which might be called "Forward, Lemmings!"—is expanding precisely the systems that are most vulnerable: Power grids with ever bigger stations and longer transmission lines, offshore and Arctic oil and gas, big pipelines, and synfuels. In practical effect, for example, the coal policies of recent administrations aim to create in Wyoming a new, all-American Strait of Hormuz. Our Nation is continuing to build an energy system fit only for a tranquil "technological paradise" in which everything works according to the blueprints. Alas, the future will not be like that at all.

The third part of our analysis draws on biology, and on the design of computers, warships, aircraft, reactors, and other devices, to derive about 20 design principles for inherently resilient systems. Such systems cannot suffer major failures. They do not merely withstand stress, but emerge from it more resilient than before. An energy system designed on these principles would be more efficient, diverse, dispersed, and renewable. This would make our Nation stronger and far more secure. But perhaps the best news is that the "premium" we must pay for the "insurance policy" of energy resilience, far from costing us money, pays us handsomely in money and jobs, starting immediately. This is because a resilient energy system is faster to build, and cheaper both to build and to run, than the more centralized, vulnerable alternatives now in fashion.

The greatest resilience per dollar invested—the "most bounce per buck"—comes from raising energy productivity. The benefits of efficient energy use go far beyond just replacing the most vulnerable marginal sources, such as Persian Gulf oil. For example, if you live in a superinsulated house in Minnesota, and your heating

system fails in midwinter, you won't even know it for weeks. You'll find out only because the inside temperature will slowly drift down from 72°F. to 62°F. or perhaps at worst about 55°. Such a house cannot get any colder than that, so neither you nor your pipes will freeze. If a few of your neighbors come take refuge from their sub-zero house, their body heat alone will take your heat-tight house back up to 72°. If they bring a couple of kids, your house will overheat and you'll have to open the windows. Alternatively, any improvised point source of heat can heat your whole house evenly—for example, burning junk mail in a No. 10 can.

This illustrates how wringing more work from our energy will not only help us live better at lower cost, but can also make failures of energy supply more graceful and make it easier to substitute expedient supplies. On a larger scale, the half-filled gas tanks in a 50-mile-per-gallon car fleet would run them for a month. The dispersed inventories of oil between the wellhead and the gas pump would run the transportation system for a year—whereas now a major pipeline break can shut down a refinery in a few days. Thus by using energy more efficiently, we can stretch our stocks, using them up so slowly that we have time to fix whatever is broken or to improvise new supplies.

Over the next few decades, renewable energy sources—now over 7 percent of total U.S. energy supplies, and the fastest-growing part—can replace most of the vulnerable parts of the energy system. Renewable energy flows cannot be cut off and require little or no distribution system. Many renewable sources do fluctuate with time and weather, but this can easily be handled by good design and by combining different sources so that conditions which are bad for one are good for another. Indeed, this can make renewable supplies more reliable and predictable than present ones: We can predict sun, wind, and rain much better than we can predict reactor accidents, terrorism, or Saudi politics.

Dispersed renewable sources, each supplying energy at the right scale and quality to do its particular task in the cheapest way, do not automatically guarantee resilience. To fulfill their promise, they need to be hooked up so that they can get all the normal benefits of interconnection but can also stand alone in an emergency. This ability has proven invaluble even with nonrenewable sources. When the power engineer in Holyoke, Mass. saw the 1965 Northeast blackout rolling toward him, he isolated the city from the grid and powered Holyoke with a newly installed gas turbine. Not having to turn off the city paid off the capital cost of that powerplant in 4 hours. Likewise, a man who powers his house with wind on the northern Great Plains recently reported that he was watching the TV news one night and saw that his whole area was blacked out. He went outside and looked. Sure enough, all his neighbors' lights were off. So he came inside and watched TV some more to see when his neighbors' lights would come back on.

Many of us would like to be in that position. And with modern renewable technologies, we can be, whether we're in the countryside or the city—but only if we change some rules. Today, most utilities allow dispersed sources to be connected with the power grid only in such a way that if the grid crashes, the dispersed sources cannot work at all. This is not necessary for safety or for

any other technical or economic reason. It should be changed. Our analysis identifies several such Federal policy issues which, if not promptly acted upon, will cause many of the potential resilience benefits of renewables to be lost.

Efficiency and renewables are already the fastest-growing parts of our Nation's energy supplies. Since 1979, the United States has gotten more than 100 times as much new energy from savings as from all expansions of energy supply combined. Of those expansions, too, we have gotten more new energy from renewables than from any or all of the nonrenewables, despite the massive imbalance of investments and subsidies in the other direction. This new predominance of resilient energy systems has come about from the bottom up, not from the top down. It vindicates the Jeffersonians, who think people are pretty smart and, given incentive and opportunity, can choose wisely for themselves. It also vindicates the true free-marketers, who say that we can do many small, simple, accessible things faster through a decentralized market process than we could do a few big, complex things through a centrally planned economy on the Soviet model.

It does not, however, vindicate this administration's view that there is no need for Federal action (except to try to resuscitate a nuclear industry now dying of an incurable attack of market forces). What enables a free market to work, after all, is open and fair access to information and capital. In the imperfect market we have, much of what has enabled energy efficiency and renewables to do as well as they have has come from Washington—in the form of information programs, such as DOE's now-shattered Office of Consumer Affairs used to run; seed funding to enable State and local energy offices to spread the word on available opportunities; abolition or, failing that, at least equality of subsides; and measures like the Public Utility Regulatory Policies Act to create a more competitive market in energy services. Both economic and military security demand more such programs, not fewer.

Yet despite the many new barriers lately placed in their way, thousands of communities and millions of individuals are starting locally to transform our energy system from vulnerability to resilience. Communities are realizing that they can achieve energy security, and stop the hemorrhage of energy payments, only by mobilizing their own resources now, not by waiting for someone else who might do something for them in 10 years. Continued leadership of the kind this committee has provided so well—especially in the form of clearing institutional barriers and providing access to information—could enable small business to expand the innovation and entrepreneurship that have already helped signally to make local energy mobilization a striking national trend.

[Biographical sketch follows:]

BIOGRAPHICAL SKETCH OF AMORY B. AND L. HUNTER LOVINS

Amory B. Lovins and L. Hunter Lovins work as a team on energy and resource policy, consulting and lecturing in over 15 countries. Currently Henry R. Luce Visiting Professors at Dartmouth College, they are joint Policy Advisors to Friends of the Earth, a U.S. conservation group.

Amory Lovins, a physicist, was born in Washington, D.C. in 1947. After two years each at Harvard College and at Magdalen College, Oxford, he became a Junior Research Fellow of Merton College, Oxford in 1969. He resigned in 1971 to work for

Friends of the Earth, based in London during 1971–81. He is also vice-president of Friends of the Earth Foundation.

Mr. Lovins received an Oxford M.A. degree by Special Resolution in 1971 and D.Sc. degrees honoris causa from Bates College (1979) and Williams College (1981). Twice Regents' Lecturer in the University of California (Berkeley, energy policy, spring 1978, and Riverside, economics, spring 1980), he was 1979 Grauer lecturer in the University of British Columbia, and will be Distinguished Visiting Professor at the University of Colorado at Boulder this summer.

His clients have included a wide variety of international agencies; U.S., foreign, and State governments; industries; and financial institutions. He has published 11 books and numerous technical papers, and served in 1980–81 on the Energy Research Advisory Board of the U.S. Department of Energy.

Hunter Lovins is a lawyer, political scientist, sociologist, and forester. Born in Vermont in 1950, she received a B.A. degree from Pitzer College in political studies and sociology. Her J.D. degree from Loyola University School of Law (Los Angeles) was accompanied by the Alumni Award for Outstanding Service. Since 1975 she has been a member of the California Bar and a partner of Hirschtick & Sheldon in Los Angeles.

From 1974 to 1979 Ms. Lovins served as Assistant Director of the California Conservation Project ("Tree People"), which she helped to establish in Los Angeles and whose energy and environmental programs she developed. She has lectured and consulted widely; taught workshops for the University of Oklahoma, the American Association for the Advancement of Science, and others; and served in 1979 on the City of Los Angeles Energy Management Advisory Board.

Ms. Lovins has co-authored and edited many papers and three books: "Energy/War: Breaking the Nuclear Link" (1980), "Brittle Power: Energy Strategy for National Security" (1982), "Least-Cost Energy: Solving the CO_2 Problem" (1982). The latter two describe research done under contract to the U.S. Defense Civil Preparedness Agency and the German Federal Environmental Agency respectively.

The Lovinses have won a 1982 Mitchell Prize for their analysis of how electric utilities can regain financial health. Their work is the subject of the 16mm film "Lovins on the Soft Path," now in the finals of the American Film Festival. They are building a solar house/bioshelter/research center in western Colorado, and will continue policy research there—on energy, water, soil fertility, and peace—as principals of the newly formed Rocky Mountain Institute.

Mr. BEDELL. Thank you, Amory and Hunter.

Mr. Heffernan.

TESTIMONY OF PATRICK H. HEFFERNAN, SPECIAL CONSULTANT FOR INTERNATIONAL AFFAIRS, CALIFORNIA ENERGY COMMISSION

Mr. HEFFERNAN. Thank you, Mr. Chairman.

It is an honor and privilege to be here today.

I am here as a representative of the Honorable Commissioner Emilio E. Varanini III, chairman of the commission's contingency planning committee, which was organized to meet the State legislature's mandate that the commission prepare the State for an energy emergency.

Commissioner Varanini regrets that a prior commitment prevents his appearance here today and he hopes that the testimony I provide will meet the needs of the subcommittee.

As special consultant for international affairs to the commission, I report directly to Commissioner Varanini. In this capacity I supervised the staff analysis of a 3-day simulation of a Middle Eastern oil emergency conducted for the commission by the Rand Corp.

Participants in this simulation exercise included the State, Federal, and military officials who have responsibility for managing an actual oil emergency.

My testimony today is based on the results of that simulation. Our analysis of the moves of the actors in the simulation and also

other commissions' studies on the effects of the shortages on California and the country.

Our report entitled "Behavior of Government in an Oil Emergency" has not been published and is not on the public record; however, my comments today are drawn from the study and can be a part of the public record.

A principal objective of my testimony this morning is to stress the impacts of an oil shortage on small business and agriculture sectors of California's economy under current Federal energy management policy and to describe the measures that the State of California is taking to mitigate those impacts.

I will also discuss defects in the administration's energy emergency policy which we feel, at the commission, will threaten to do damage to small business and to agriculture and which also may conflict with our State's ability to protect our economy in the event of an oil shortage.

By way of background I would like to point out that California is the fourth largest oil producer in the country, producing about 1 million barrels of oil a day, and supplies about 50 percent of its own oil. Forty percent comes from Alaska and the remainder comes from miscellaneous sources, about 9 percent of which comes from Indonesia.

Although the State imports no oil from the Middle East, our oil supplies are part of a world oil market. However, California is isolated from the oil distribution system of the rest of the country. Only one pipeline connects California to Texas and points east. Tankering oil from California through the Panama Canal is time-consuming, expensive, and impractical.

As a result, California imports no significant amounts of oil or product from the rest of the country and sends only a small portion of Alaskan oil to the lower 48 States.

In hearings before the commission's contingency planning commission this past March, several internationally respected authorities on the Middle East, including Dr. William Quant of the Brookings Institute, and James Akens, warned us that a Middle Eastern oil emergency is highly probable in the near term.

In the event of such an emergency in which OPEC countries reduced or cut off oil supplies to the western world, the Federal Government would have to consider shipping oil to Japan and Europe, either to meet our obligation to other oil-consuming nations as part of an International Energy Agency agreement or to guarantee the economic and military security of our NATO allies.

In either case, California-bound Alaskan North Slope oil would be the only available crude oil that could practically, for logistical reasons, be diverted overseas, making California as vulnerable to an oil crisis as the other States, that is, the States that are directly dependent on Middle Eastern oil.

Loss of the Alaskan crude oil supply would be very damaging to our economy and to the economies of the other Western States.

To examine the potential for this damage and to develop options for reducing it, the Commission contracted with the Rand Corp. for the oil emergency simulation study I have mentioned.

We hoped to gain insight into the probable behavior of the States and Federal Government during an oil crisis with that simulation. Our findings from that simulation were as follows:

First of all, foreign policy considerations will override domestic economic needs during an oil emergency. During the simulation, U.S. foreign policy advisers recommended sharing our oil with Japan and with NATO nations using this Strategic Petroleum Reserve to hold down oil prices.

The oil they would have shared would have been the Alaskan North Slope oil.

These recommendations took precedence over domestic economic needs, and since I served on the Domestic Policy Council in that simulation, I watched that dynamic go on. We were very clear as to the impacts on the domestic economy of shipping oil overseas and we saw that the foreign policy advisers consistently prevailed over players from the White House.

In the simulation, the White House ordered diversion of oil overseas without consulting States, although several States suffered economic hardships as a result.

The failure of the Federal Government to place State delegates or observers on the U.S. delegation to the International Energy Agency indicates that the States are not currently considered by the White House or the State Department in their deliberations over whether or not oil should be exported to NATO and Japan in the event of an oil emergency.

Second, a small physical shortage of crude oil in the United States will increase gasoline and diesel fuel prices beyond the reach of many buyers.

During the simulation exercise the computers showed that an oil shortage of less than 12 percent nationwide triggered a runup of price to over $50 a barrel and gasoline to over $2 a gallon.

Prior to this, the Commission ordered a study by UCLA Business School in which we asked them to tell us what the expected prices of oil and gas would be in a 12-percent shortage. Their results: Oil prices went up to $83 a barrel and gasoline reached $3 a gallon.

In the exercises, farmers and truckers were hurt immediately because these industries are fuel-intensive, cash-poor, and deal in time-dependent products. A rapid runup of diesel prices will cripple farmers and affect their suppliers and the truckers, causing, we feel, many to go permanently out of business.

Third, the current Federal energy emergency management policies will aggravate the problems of an oil shortage transforming a small physical shortage into an economic disaster.

The current policy of the Federal Government is to allow the free market to allocate supplies during a shortage.

While our experience in 1973 and 1977 has shown us that the free market in the long run is the only way to allocate energy supplies, in the short run during an emergency it might not be the best way.

The administration has said it will not control prices, direct supplies or otherwise intervene in the fuels market. Prices will rise to market clearing levels. Those who can afford oil will have it, and those who can't will get very little.

During the Rand exercise this policy was found to prevent the Department of Energy from alleviating the impact of oil shortages and price increases.

The only option the Department of Energy participants could consider was a windfall profits tax rebated back to consumers through existing cash transfer mechanism. However, simulation participants found that the windfall profits tax cannot be implemented quickly and accurately enough to prevent economic damage to small business and farmers.

Participants were faced with a minimum 3-month lead time to set up and test a system for rebating as much as $100 billion which would be necessary. This was too late for farmers in planting or harvesting systems and truckers who needed fuel to move perishable cargos. In the simulation, those businesses went bankrupt.

Moreover, social security, welfare, and reduction of income tax withholding will not reach most small businesses and farmers because they don't receive welfare or social security and usually they file quarterly and don't have tax withholding.

Fourth, State-Federal conflict is likely to occur in the event that States should act to protect their economies. State representatives participating in the Rand simulation moved to protect their economies in the face of this Federal inaction. They sought to control oil prices and destinations internally and began to cooperate with one another to control it within the State.

The staff and analysis shows that this independent action would lead to conflict in 10 major areas under emergency policy.

I won't list the 10 areas, you can read them, but the major one is State set-asides for critical purposes. The State would like fuel set-asides. Under current Federal policy, set-asides are an "illegal" intervention in the market.

The problem underlying these conflicts is that under current Federal policy, States are left without a defined role in any crisis management. State officials have been handed a dilemma by the Reagan administration. Under the New Federalism, States are encouraged to act independently to resolve local problems arising from an oil shortage. Yet, under the free market approach to crisis management, States will have very little voice in Federal decision-making and will be denied the necessary information to take effective independent action.

The results of the Rand exercise indicated that States will take action as best they can regardless of Federal policy, leading to conflicts. As an aside here, I might point out that the Federal Petroleum Allocation Act would have specifically overridden the State authority to act independently.

Independent State action will probably result in at least 50, if not several hundred, lawsuits filed by the States against the Department of Energy and the White House if they attempt to interdict State action.

California's response to this dilemma is to pursue a two-pronged energy emergency management program: First, to reduce California's vulnerability to external oil emergencies; and second, to devise a plan for managing an energy crisis to mitigate its impact on sensitive sectors of the State's economy. The management pro-

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gram is still in the Department and may not be available for discussion until later this year.

However, details of the vulnerability reduction program are available and many of the programs are now in place. They were summarized in the Commission's 1981 biennial report, in which the Commission recommended the following actions:

(1) Continued State funding of promising projects for wind, solar, and geothermal power.

(2) Approve new powerplants sufficient to displace 50 percent of the oil and gas now burned to make electricity.

(3) Remove Federal restrictions on fuel use to allow large users the flexibility to use whatever fuel is available.

(4) Approve legislation mandating that energy improvements be made to existing housing at the time of sale.

(5) Tougher State energy efficiency standards for new residential and commercial buildings.

(6) A new Federal fuel efficiency standard of 40 miles per gallon for new cars by 1995.

(7) New State efficiency standards for lighting, motors, and pumps in commercial and industrial plants.

(8) Continued State funding of pilot plants to produce alcohol fuels for vehicle fleets.

(9) Promote the transition of gas and electric utilities to energy service companies.

(10) Increase production of oil from the State's heavy oilfields.

(11) Remove restrictions on energy prices which keep them artificially low, in order to reflect the full energy costs in consumers' buying choices.

Many of these actions have already taken place. The decrease in oil consumption that the State has seen in the past year reflects more efficient autos, increased insulation in homes, improved building efficiency standards and more energy-efficient buildings, increased production of energy from micro and small-sized hydroprojects, wind generation of electricity, geothermal wells, cogeneration projects, and more efficient use of water and electricity in agricultural and industrial processes.

At the same time, the California oil industry has increased its production of heavy crude oil by downhole stimulation techniques. California refiners are now planning to modify as much as 20 percent of the State's refining capacity to refine domestic heavy crude oils more efficiently into high octane fuels and distillates—a program encouraged and financially assisted by the Commission.

While I have spent much of my testimony on the results of our research and the problems we have with Federal energy emergency management policy, I cannot stress enough that the key to energy security lies in vulnerability reduction—learning to do the tasks of society more efficiently so that no sector of the State is exposed to damage as a result of the sudden loss of imported energy supplies.

California's energy plan is designed to meet this goal. The prospect of an oil crisis and the need for an emergency management program to cope with it add new urgency to the State energy law.

Mr. BEDELL. Thank you very much, Mr. Heffernan.

Dr. Kupperman, please.

TESTIMONY OF ROBERT KUPPERMAN, EXECUTIVE DIRECTOR, CENTER FOR STRATEGIC AND INTERNATIONAL STUDIES, GEORGETOWN UNIVERSITY

Mr. KUPPERMAN. Thank you very much. I do not have a prepared statement but I would like to comment on the issues that have been raised so far and talk a bit about the Federal Emergency Management Agency. Your staff also asked me to talk a bit about the subject of terrorism.

First of all, there is no question whatsoever that virtually every energy distribution system in the United States is catastrophically vulnerable to sabotage. Solutions, however, in the near term—certainly those that would be realistic so far as industry is concerned—would cost a great deal of money, and it is not at all clear that we would end up with a resilient system no matter how much we invest in protecting the energy distribution systems that we have today.

Many in industry will accuse us, if we try to do this, of seeking considerable self-sufficiency; of excessive social engineering. This I have sensed and understood in the days that I was in the White House, and afterward, when I ran the transition for the Federal Emergency Management Agency.

In the interim, I think that at a minimum we have to develop good policy and perform cost-effectiveness studies. Though I have not had a chance to read the Lovins book I am sure this is an example of the sorts of things that we ought to be doing.

Clearly, if we are going to protect critical nodes of the gas pipeline system and the electrical power grid, we have to consider means of redundancy and diversification techniques and physical hardening.

At this very moment, some of the key chokepoints in the distribution systems in the United States are guarded by no more than a chain link fence.

If we are to be realistic, we also must study the business of energy distribution networks in concert with the equally vulnerable collateral networks, including transportation and data flow such as the Federal Reserve and communications.

As transition leader for FEMA, I saw little evidence that FEMA had done any contingency planning whatsoever, and I was deeply concerned by what I felt to be a collection of once-bright people who were absolutely demoralized.

I hope that since the time of the transition a lot has changed.

We have to be realistic enough to understand that we may end up suffering a massive catastrophe measured in terms of electrical power generation and energy distribution.

We have done little or no planning whatsoever, in my view, to deal with those issues.

Beyond physical redundancy and physical hardening—which are both very expensive—Government must do the planning to cope if the disaster itself were it to occur.

Government must have done the exercises, simulations, and have developed the contingency plans to deal with New York's electricity being cut off for, say, a month—a task which could be all too easily done. How would we cope with the sheltering, the feeding,

and the health care problems of a cluster point of 7 or 8 million people?

We have no idea whatsoever; and there has been, to the best of my knowledge, absolutely zero planning.

Now, we also must think of energy distribution in terms of more traditional national security needs. We have a critical and strategic materials stockpile which stores nickel, aluminum, silver, whatever. The stockpile is in a sense a relic of the mobilization dreams of World War II, now valued, I have heard, at some $15 billion.

We ought to think about stockpiling key elements, intermediate goods—certain transformers, for example.

We ought to sell off that which is going to be of very little use to us, even the pork barrel matters that got certain materials into the stockpile originally. We need to deal with a wide variety of contingencies, including the failure of electrical power.

It seems to me that in addition to looking at the long run self-sufficiency goals that the Lovins have spoken about, we have to examine interim problems that will not be resolved easily.

Let me just talk for a moment about the subject of terrorism. Terrorism is a form of unconventional warfare. Certainly, it has become an extremely influential tool of warfare, particularly since the 1972 Munich Olympics incident. Terrorist organizations are small in size. There are about 140 of them around the world.

The problem that we are seeing is that terrorism operates in de facto partnership with the media and employs high technology, including jet transport, and instant global communications via satellite.

One has to just think of the effects the Iranian situation had, virtually paralyzing the U.S. Government.

We can see as well that this same thing has happened to a number of other governments, such as Italy's Aldo Moro incident in 1978. Incidentally, right after the Aldo Moro affair, terrorists attacked Rome's electrical power system. They just weren't bright enough or technically knowledgeable enough to know what to hit.

It seems to me that America and Western Europe have become bored with the airline hijackings. Further, we can handle those. What we are going to see are far more sophisticated, highly disruptive attacks, possibly in the United States itself.

We have seen the beginnings of this in attacks against electrical power and gas pipelines, and nuclear power stations in Spain, France, and Italy.

I don't think that we can hold ourselves immune, for I think it is likely to happen here. The price of some thought is small. The price without having given any thought to the matter, without the needed contingency planning, is absolutely catastrophic.

Thank you very much.

Mr. BEDELL. Thank you very much, Doctor.

Mr. Chappie.

Mr. CHAPPIE. No questions at this point, Mr. Chairman.

Mr. BEDELL. Thank you.

I have a number of questions. Either one of the Lovins can answer.

You indicated that there are three electric grids in the whole country. Does this mean that if those three were knocked out it would pretty well wreck our total electric distribution system?

Mr. LOVINS. Yes. Broadly speaking, there is an eastern grid and a western grid which touch around Nebraska, and then the Texas grid is independent. That is the third one.

We don't count Alaska and Hawaii which, of course, are special cases.

The power industry likes to think that within each of the regional pools which constitute the east and west grids there is a great deal of flexibility to reroute power and to make good deficits if a particular group of stations or transmission sectors should be out of action.

We suspect very strongly from reviewing the literature that this flexibility is a lot less than it first appears. It depends critically on the operation of certain key transmission sectors and of the switching and transformer equipment at each end of the transmission line.

Quite often the spare parts needed to repair those pieces of equipment take months or years to manufacture. Some of them aren't even made in the United States. Some of them are not kept in stock at all.

The grid has also grown up in such a way that it does strange things on its own. That is, its behavior is not nearly as well understood as we would like. As the transmission lines get longer, the grid is becoming more and more prone to bizarre failure modes.

Just recently, the failure of the Pacific intertie in Oregon caused blackouts as far south as Arizona. That sort of incident is becoming more and more common.

Mr. BEDELL. I presume that they are extremely vulnerable to many types of activity, are they, Doctor? As you said, they are not really guarded.

Mr. KUPPERMAN. That is right.

Now, there was a group operating in California known as the New World Liberation Front. We haven't heard from them in quite awhile, but they attacked the electrical power system some 70 times.

For whatever reason, whether it is incompetence or lack of interest in causing real trouble, they attacked relatively unimportant targets of the grid elements that are easily fixed.

Unfortunately, there is not just one chokepoint to take out. For example, if we had a band of well trained paramilitary types. Say 10 of them split up into groups of 3. They could simultaneously take out three or more key components with antitank weapons that are available for sale in Europe or in the Mideast and it would be over.

Mr. BEDELL. What do you mean "it would be over?"

Mr. KUPPERMAN. Electrical power distribution would be severely strained, possibly to the extent of effecting serious blackouts for extended periods.

Mr. BEDELL. For how big an area?

Mr. KUPPERMAN. Depending on where in the grid it is hit, it could be the Northeast corridor, for example. It could be the Metropolitan New York area.

Mr. BEDELL. And how long would it take to repair that and get it back?

Mr. KUPPERMAN. Anywhere from weeks to months. I can't give you an exact answer.

Mr. BEDELL. Thank you.

Did you have something to add?

Mr. LOVINS. I might add, Mr. Chairman, that the only thing that keeps the grid working in exact synchrony across almost continental areas is a very elaborate system of control and communications.

It is computerized. It requires response in small fractions of a second to any irregularity in the grid. We suspect that that control system is much more vulnerable than the grid itself.

In fact, the communication that makes the grid hang together is quite often so open, for example, microwave links, that it is not at all implausible that people with the technical sophistication of, say, phone freaks, could with a hand-held microwave dish simply take over the grid and run it themselves.

Mr. BEDELL. Thank you very much. I have some more questions.

Mr. Wolpe, I will be glad to yield to you at this point.

Mr. WOLPE. I thank you, Mr. Chairman, for yielding to me. I am very pleased to be able to sit in with you at this hearing today. I happen to serve on two energy subcommittees on the Science and Technology Committee and I was interested in the panel this morning precisely because the dimension of energy security that is the subject matter is a subject that I have yet to hear really introduced as part of the discussion of our national energy policy.

I think the only time you hear any discussion with respect to energy security matters relates to our access to foreign oil, really, and to the continuation of our access to oil supplies abroad. The whole question of what we have done here at home in terms of our national energy policy and its implications for national security is a subject that has never been in the proper domain of the Science and Technology Committee or the broader issues of impact for the small business community or the agricultural community in America, or more generally, the whole military dimension.

So I think the hearing this morning is a matter of real urgency and ought to come before many of the committees of this Congress in a very direct way.

You submitted the report to the Federal Emergency Management Agency some 6 months ago. Could you indicate what the response of FEMA has been up to this point? Has there been any kind of Government initiation of an effort to address the concerns that you presented in the study?

Mr. LOVINS. We submitted a draft to FEMA actually 1 year ago which was very similar to what was finally released in November. In fact, there weren't any technical changes in the report. There were some changes in the degree of tact with which we described the Department of Energy's lack of consciousness of these issues.

As far as I am aware there has been no action taken as a result of our report.

Mr. BEDELL. Would the gentleman yield?

Mr. WOLPE. Sure.

Mr. BEDELL. Dr. Kupperman, do you have any knowledge on that?

Mr. KUPPERMAN. No, I don't. At the time of the transition I had not seen the report. In fact, I must in fairness simply state that I have not followed the activities of FEMA closely since the end of the transition period.

Let me just add one thing to bring the issue of vulnerability home to you.

Just before the time of the Democratic National Convention in New York in which they renominated Jimmy Carter, the New York Police got lucky. They raided a safe house of a particular terrorist group. There they found detailed plans, diagrams of the New York State electrical power system and detailed plans of Madison Square Garden.

In other words, at least having shown some analytic interest and political interest in disrupting the electoral system of the United States.

Mr. WOLPE. Could I ask a more general question?

I suspect that the major criticism that will be advanced to the analysis that has been presented here is that it may be too late. That is, we have created a very centralized system for electricity generation in particular and that it is simply too difficult and too costly to undo the vulnerability that has been created in any realistic fashion.

What would be your response to that?

Mrs. LOVINS. We have several chapters in "Brittle Power" in which we examine the economic costs of moving incrementally toward a more efficient and renewably based energy system.

The good news is that this is in any event our very best buy, first efficiency and then renewables. Thus any decision to add new capacity ought to concentrate on pushing efficiency and renewables in exactly the way that California is now beginning to.

We feel that in a "technological paradise" in which Dr. Kupperman's descriptions of what damage is possible were somehow magically removed, over a period of 20 to 50 years we would evolve a secure energy system simply because of economics. The free market would indeed handle it.

The urgency arises when you realize that what Dr. Kupperman is describing is a case of extreme good fortune on our part that we have not so far seen the major disruption that is possible.

It becomes particularly urgent when you look at the impact now of present energy prices on communities. Something like 80 to 90 percent of each community's energy budget leaves that community and goes to Arabia, Venezuela, Texas, to pay for energy. Communities all across the country are bleeding to death because they cannot now pay for energy, let alone survive, if that energy supply were cut off.

As a result, some communities are beginning to move toward secure energy just to stop this hemorrhage of money. Our analysis outlines the technologies that are now available, and now cost-effective to enable communities to do that.

In chapter 17 of the book we describe what communities can do, and institutional mechanisms to implement this. There is much that the Federal Government can do to help, as I mentioned in my section of the testimony.

In particular we need information. People need to know where to go to find out what is possible. There needs to be equitable access to capital. These are essential to the workings of a free market and it is the role of Government to remove the barriers that now stand in the way of a free market and enable it to work even better.

I think if this is done, the course we outline is the best way to move with a sense of urgency. The good news is that it is possible. The bad news is we don't know how long we have.

Mr. LOVINS. May I add that I think that we would clearly much rather not start from where we are. One thinks of the instructions in a mariner's manual saying what to do if caught in a gale on a lee shore. First of all, never allow your vessel to be found in this predicament.

The whole thrust of Federal energy policy is emphasizing those systems which are inherently most vulnerable: More and bigger pipelines in remote areas, like the Alaskan pipelines, much greater reliance on offshore and Arctic oil and gas synthetic fuels, bigger, and more remote power stations, longer transmission lines, and so on, while at the same time, trying to stifle what is already starting to increase our energy resilience, for example, improving the energy/GDP ration by 4 or 5 percent a year. We would agree that it is essential over the next few decades to take much greater care to plan for and guard against disruptions.

Particularly by improving spare parts stocks and stocks of critical skills and equipment for making repairs.

We found, for example, a single loss of a refinery could easily exhaust the entire national stock of a common kind of motor without which we can't make refineries work. We found that the entire Gulf coast——

Mr. BEDELL. Excuse me, would you repeat that?

Mr. LOVINS. There is a common device called an explosion-proof motor which is used to run pumps and other equipment in oil and gas installations. There are typically fewer than 100 large motors of this type kept in stock in the whole country, which wouldn't even be enough to rebuild one refinery. We have several hundred refineries.

Likewise, virtually the whole repair capacity for the Gulf of Mexico coastal oil business lives on one canal which would be bottled up by sinking one barge.

I understand that in the trans-Alaska pipeline, where there has been a little bit of attention given to security problems, there is now a debate going on about stocking spare pumps, which are a unique special-order item. The pumps enable the oil to be pumped over the mountains. If one of those is lost in the wrong place in the winter, the trans-Alaska pipeline could turn into the world's largest Chapstick. The debate going on is whether, if we ordered spare pumps, they should be stored somewhere else where it might be impossible to get them to the pipeline in the winter or whether they should be stored in the existing pumping station so that whoever blew up one pump could blow up both of them at the same time.

The Strategic Petroleum Reserve was the only Federal energy project we could find in which there had been much thought about security against disruption. And even that consideration was very

limited. It was not done with any guidance from FEMA. The SPR people did it on their own initiative.

I think none of us as we contemplate these threats, would like to be in the position, as we contemplate these threats of the British intelligence officer who retired in 1950 after four decades of service and reminisced: "Year after year the worriers and fretters would come to me with awful rumors of the outbreak of war. I denied it each time. I was only wrong twice."

Mr. MAVROULES. I was hopeful that someone could elaborate as relates to the barriers that you mentioned.

Could you tell me, specifically, what are the major barriers? I suspect that you are alluding to FEMA or the Department of Energy setting up the roadblocks that deny the opportunity for new sources.

Can you elaborate on that?

Mr. LOVINS. I think there are two parts to our answer. First of all, we found virtually no consciousness in the executive branch of the true dimensions of energy vulnerability. Energy security was defined as the possibility of a cutoff of oil imports. Therefore, the Government did many things to try to replace foreign oil which turned out to be at least as vulnerable as foreign oil and in many cases more so.

So in order to take even the necessary short-term steps Dr. Kupperman has mentioned, there has to be a great raising of consciousness of the problem of the kind that I hope this hearing will elicit.

Beyond that, there are many specific barriers which Hunter will elaborate, to doing first those things which are both more economically efficient and more resilient.

Mrs. LOVINS. There are roughly two kinds of what we call institutional barriers or market imperfections. The first kind affects price levels so that consumers are being kidded into investing in something that if prices told the truth they would not necessarily invest in.

The second kind affects people's ability to respond to an incentive which they would have if the prices told the truth. If we know how much energy costs, then we can decide how much is enough, and when to begin investing in efficiency or renewables.

Most of the first type of barriers occur at a Federal level. They are things like price and tax subsidies. We would prefer that the entire energy sector be desubsidized: simply let the market tell people what the replacement costs of various forms of energy are.

That, I think, would be sufficient information on the incentive side.

Absent that (and I have no delusion that we will get to that any time soon), we ought at least to structure the subsidies so that those forms of energy which give us the most bounce per buck are seen as more attractive by the consumer than the more vulnerable forms of energy.

That means some form of parity in subsidies for renewables and efficiency. That is, of course, what this administration is seeking to avoid doing.

The other institutional barriers are mostly at a State and local level. There are many of them. They are very messy to get out of the way. They are things like split incentives.

If you are a landlord and I am a tenant, we have different interests in fixing up the building. Why should I pay to fix your building, especially if you pay the utilities? There are ways of dealing with this. There are books available that tell how to go about doing it, how to work with your landlord. There are institutions which loan to the landlord in such a way that both the landlord and the tenant get a benefit out of it.

The Solar and Conservation Bank had a provision in it for loans to tenants or landlords. That is one of the few instances of a Federal action actually helping break down a local institutional barrier. Those kind of actions ought to be encouraged.

Local building codes frequently won't allow you to build the kind of house that simply could not be turned off. There is often inequitable access to capital at a local level.

There are ways around all of these problems.

The Department of Energy's Office of Consumer Affairs had in place a number of programs to inform citizens of what they could do, and to inform States of programs they could put in place.

The demise of that program is one of the most grievous losses we have suffered recently. One of our strongest recommendations would be to get in place an effective Federal information program to begin to break down those local barriers.

This is what is holding up small business and citizens from simply getting on with solving the energy problem. The faster we can get those barriers out of the way, the faster this problem will be over with.

Mr. BEDELL. You say that you feel the subsidies should be removed. How do you feel about Federal support of research on new and renewable energy resources such as photovoltaics, for example?

Mrs. LOVINS. You can make an argument on behalf of that where you can show that a technology is, at this point, perhaps high-risk but with the potential of a large payoff where you can do the back-of-the-envelope calculations to show that if the technology works it would be cost-effective against other options.

This sort of calculation would kill a number of research efforts now underway on such technologies as fusion, which you can show right off are uneconomic and very vulnerable. But in an area such as photovoltaics—where you can show potentially large payoffs, where domestic industry is not investing in enough research into the next generation of technology, where the research effort that was underway has been shown to be very cost-effective—I think you can make a strong case for those kinds of subsidies.

That research would not be done absent Federal support for it.

Mr. BEDELL. So, you do support, then, that type of Federal effort?

Mrs. LOVINS. Where values such as national security are at stake, yes. Taking it on a case-by-case basis, forcing each technology to make its case, and in general not pouring money on a problem but identifying those areas where a certain amount of money will make the difference.

Mr. LOVINS. For example, Mr. Chairman, we have identified specific areas in the photovoltaics program where a great resiliency opportunity may be lost for a lack of some simple Federal action.

We mentioned in our prepared statement the question of how dispersed sources like photovoltaics are hooked up to the utility whether they can operate on their own in the absence of the grid or not.

But another area, for example, is whether the wiring that the photovoltaics will power is standardized at some voltage like 12 or 24 volts d.c. so the different manufacturers can start to make compatible products for interconnecting with the grid, with storage devices, and with devices to use the energy. Otherwise no manufacturer has an interest to standardize. Quite the contrary, we may see a proliferation of incompatible kinds of energy equipment.

If we standardize on 12, or plus or minus 12 volts, we could have emergency interties between buildings and vehicles. Just the generators and alternators in our cars and trucks are equivalent to a sixth of the entire national generating capacity, so that is not a trivial energy source.

Mr. BEDELL. Dr. Kupperman, you made a statement I didn't quite catch, something about the transition where bright people are demoralized.

I didn't understand exactly what you said.

Mr. KUPPERMAN. At the time I directed the transition team I felt that the Federal Emergency Management Agency was demoralized and not doing the contingency planning that it should have done.

As to what has happened in the interim since the transition was over, I have not paid close attention. As I have talked on a number of occasions with Louis Giuffrida, the Director of FEMA, and I am impressed that he is a thoughtful and bright person. I think he has great odds of inertia in that agency to get to do the needed planning. I know that Ed Meese is quite interested in the question as well.

That is not a partisan issue. It is purely a matter of interests and the personalities that are involved. The issue of contingency planning in any White House, having served in several of them, is very troublesome. All White Houses have planning horizon little more than a day or so. They just go from fire to fire.

In the case of FEMA, we are dealing with disasters of such a magnitude that nobody wishes to think about them. There is a denial syndrome that occurs everywhere. Certainly, terrorism is an example.

How can you tell a general, for example, who looks at lots of troops and heavy equipment, that 10 people can take them out. It is a very hard notion for anyone to swallow, but it is also a hard notion for a large country to believe that a rogue state such as Iran could seriously embarrass us, if not paralyze us, for quite some time.

Mr. BEDELL. But I would assume that if that assessment is correct, then there is something wrong with leadership that will not at least address the problem. Surely you must agree with that.

I have trouble trying to excuse somebody by saying that it is difficult for them to face their problem.

Mr. KUPPERMAN. Well, let me try to answer this to the extent that I don't know what Mr. Giuffrida has or has not done since that time. He has massive tasks to deal with. Past leaderships have

not addressed these issues. I cannot make any further statement because I do not know what Mr. Giuffrida is doing.

I am impressed by what he has said to me. He is genuinely trying.

Mr. BEDELL. But you know we just had the veto of legislation that was passed that would have given the President authority to set up a program in case of a disruption of our energy supplies? Do you believe there was logic to such a veto?

Mr. KUPPERMAN. Mr. Chairman, I am really not that knowledgeable about the bill or its meaning and implications. Certainly I am convinced that if a great emergency occurred, that Congress could rapidly enact such a bill.

Mr. BEDELL. Well, I think the whole issue is whether we should set up an emergency plan to have it ready and available in case of a disruption or not. It seems to me the administration is saying we don't want to even set up such a plan. They might argue with what the plan should contain but I can't understand, I must tell you, when the Congress says that we should try to set up some contingency plans and for the administration to say that we really shouldn't have such a plan.

Mr. KUPPERMAN. I am personally predisposed to contingency planning. I do not know why the President vetoed it.

Mr. BEDELL. Maybe somebody can answer that. Mr. Heffernan, we haven't heard much from you.

Mr. HEFFERNAN. We had quite a few conversations with the Department of Energy's office that handled contingency planning about the act the President vetoed, the Petroleum Allocation Act.

The experiences that we had in 1973 and 1978 with the attempts of the Federal Government to allocate oil and control prices during an oil shortage were a disaster. The oil system in this country—refineries, storage, tankers, et cetera—is so complex that it probably can only be run by a free market, by millions and millions of decisions.

We found that consumers were able to take actions that nobody had dreamed of to get around the allocation system.

By example, I will show you.

This is what it takes to move one tanker of oil from Alaska to California or from Saudi Arabia to the United States.

[Document proffered.]

Mr. HEFFERNAN. Every one of those little boxes in there is a transaction. It changes ownership 5 or 10 times and within each one of those little boxes there are choices that consumers can make to avoid Federal intervention.

So, when you say that the Department of Energy doesn't want to plan, they have been burned and we have been burned too. California had an Office of Oil Allocation set up in 1978 and although we were ahead of the game we also didn't do such a good job either.

On the other hand, I think you are dealing with an ideology in the Department of Energy. We believe in a free market in California, too, and we find that a free market can distribute oil supplies or electricity better than anybody else can.

But under special cases it won't, and among the special cases some sectors of the economy won't get what they need, particularly small business and agriculture.

So our feeling is, yes, the free market should operate in the case of a supply interruption but we should have some plans to take care of the sectors of the economy that can't operate.

Well, we found DOE in their advice to the President to veto that act, felt that the free market should operate regardless. It was a matter of degree.

We supported the veto because the act was written in such a way as to preempt any State action, and by vetoing that act the President allowed the States to go ahead with their plans.

The Federal act would have preempted any State action. So we supported that veto. However, we are chagrined and we are very worried that when we have called representatives of DOE before us to testify they have told us that they are going to stick to the free market without any planning and if certain sectors of the economy are hurt they are just going to be hurt and that is just the way it goes.

We are not sure that they are going to continue that. We feel that there will be so much political heat from the Congress and from their constituents that they simply can't allow that to go on. But from what we have been told—and I have testimony with me from Margaret Sibley who is in charge of emergency planning from the DOE—they will not do any planning for an oil shortage under 25 percent.

Anybody in the oil business can tell you the oil business wants planning done for a shortage of 10 percent. So I think you are dealing with an ideological position at DOE that simply hasn't been thought through, and the Congress and the Governors have not put the necessary pressures on the Secretary of DOE and the White House to let them know that they have to think it through.

Mr. BEDELL. Do you have something to add, Mr. Lovins?

Mr. LOVINS. I think the obvious outcome of this position will be a paralysis of a lot of State and local actions because people will wonder what the Feds are going to do and they will hold off until the Feds decide what to do, which may take a very long time.

All this would be happening, of course, during dramatic energy price increases, therefore dramatic capital and interest-rate squeezes. We looked at the bottlenecks likely to develop. The first victim would be the ability of consumers, small businesses, farms, to buy themselves out of trouble.

It may be that we would actually be much better off stockpiling fiberglass insulation, for example, than stockpiling oil. Our ability to respond during a crisis would be severely limited by uncertainty on policy and by shortages of capital and materials.

Mr. BEDELL. Mr. Chappie.

Mr. CHAPPIE. I wonder, Mr. Chairman, if Mr. Heffernan could relate to us some of the problems which we had during the two oil crises in California, specifically in terms of what it did to farmers and agriculturists, truckers and small business people.

Second, then, the question, does California have a plan to respond to an emergency in place at this point in time?

Mr. HEFFERNAN. In both 1973 and 1978, oil prices increased dramatically, so dramatically that small businesses, particularly farmers who were in planting, I think, in 1973 simply could not buy diesel fuel.

At the same time, the refiners were having difficulty buying enough crude oil to provide the refinery slate, that is, the output necessary to stockpile diesel and to stockpile gasoline.

So we had two squeezes going on. Refiners couldn't put out the supplies that your constituents needed and your constituents couldn't buy them if they were there.

The Federal attempts to allocate oil and to allocate crude to the refiners and allocate supplies to the end users simply didn't work. And what we had was consumers moving large distances to buy up supplies that they had heard of by media, by rumor, et cetera, and they caused, if I am not mistaken, a shortage of diesel and a shortage of gasoline motor fuel in your area.

Truckers were particularly hard hit. A trucker that piles into a truck stop these days to fill up his tank writes out a check for $1,500. When the oil prices go up four times he has to write a check for $6,000. A lot of the truckers are independent business people and they haven't got $6,000.

What do they do? Well, in some cases they shoot at gasoline stations. I wasn't in your district at the time and I don't know what they did but I suspect they threw some rocks at gasoline stations.

In 1978, we were better prepared a little bit. We had the offices set up and we were able to jawbone and to move some diesel supplies and some motor fuel supplies into hard-hit areas.

The system broke down, however, after a while. Consumers managed to get around us. The Federal Government managed to get around us and we were not able to move supplies in and if I recall, a number of our constituents came close to bankruptcy because they couldn't buy the diesel fuel to move the tractors.

Now, you asked, do we have a plan. Yes; we have a plan. It is in draft form now. It has to go through hearings. One of the hearings we are going to set up is specifically for agricultural input. We are asking the Farm Bureau and the farmers throughout the State to tell us what their problems are.

The plan is a free market plan, but it is a "stepped" free market plan. What we have attempted to do, and I can leave this with your staff, Mr. Chairman, if you would like, is to identify all of those actions the State can take that don't interfere with the free market: Removal of the sulfur controls on refineries so they can refine heavy oil in a crisis without violating the Federal and State Air Pollution Control; encourage refiners and private distributors to build up their stockpiles; institute queue-management programs, line control in gasoline stations; other things like that that don't really intervene in the market. Those will be done within the first hints of a shortage.

We will also appeal for use of private stock. If a shortage goes over 5 percent in California our plan calls for some intervention in the market through a fuel set-aside program. The fuel set-aside program will ask the refiners first, through jawboning, to set aside 3 to 5 percent of their output of distillates, diesel fuel, and motor fuel so the State can, with their cooperation, allocate it to farms, small business, truckers, and areas that simply can't buy it.

If the shortage gets above 10 percent, we can institute our emergency legislation and the Governor can order the mandatory use of some stocks.

There is something that you have to understand here. We have, in this country, a very large stockpile of oil on paper, but we have a small stockpile of oil in reality. The stockpiles of oil that are counted by the Federal Energy Management Agency include working stocks. These are stocks that are in the tanks, the refineries, and pipelines but that we can't use. They have to be in there to keep the pressure up and to keep the equipment moving.

If we try to burn those stockpiles the refineries stop, the pumps stop, and the tanks stop.

So it is kind of a game to count working stocks as part of the stockpiles.

What we are doing in California is working closely with the oil companies to identify what the true, usable stockpiles are so that we can set aside accurate set-asides and we can accurately jawbone with them.

We are having a problem with this in that the oil companies don't want to tell us what their stockpiles are and we have relied upon DOE to get that information. They have stopped supplying that information.

Mr. BEDELL. Is that information available that they are not supplying?

Mr. HEFFERNAN. The Department's Energy Information Agency is going through major reorganization and staff cutbacks right now. They used to compile some of that kind of data. They no longer do it.

Now their rationale is that the data on oil stocks is proprietary, and the oil companies don't want to provide it because it would be useful to their competition—which is the truth.

We have tried to convince the oil industry that if we are provided that data we can keep it secret. We now have a system set up in which not even the Commission gets that information.

The State of California is ahead of the game on that. We have some of that data now coming from the oil industry. The rest of the States don't. You can't operate a set-aside program without that information.

The information I have given you is the draft plan. It has not been approved. If the shortage gets to be 10 percent. We are now looking at surcharges, mandatory allocations to hot spots, businesses, farms, small businesses, et cetera, everything short of confiscating the files and data bases of the oil companies.

We can't legally do that. Obviously, it is not something we would want to do. First we are looking at the legal basis of rebating back to our own consumers money from an oil surcharge.

Mr. BEDELL. Could you do that with oil companies that are supplying California from Texas?

Mr. HEFFERNAN. No, we can only work with oil companies that are operating within the State.

Let me emphasize at this point that we are working closely with the oil industry on these. We have a Contingency Planning Advisory Committee that includes the oil industry, and our thrust here is to do as little as possible to interrupt their business because obviously, they know how to move oil and we don't, and we are only talking about very serious shortages here.

Mr. BEDELL. Mr. Wolpe.

Mr. WOLPE. Thank you, Mr. Chairman.

I would like to pursue two different questions. One is the whole issue of whether or not present policies that are being pursued by the administration are, in fact, while the ideological thrust is that of the dependence upon the marketplace, the free market, whether or not the policies that are really in place are, in fact, that?

If you take a look at the research and development budget that has been proposed by the administration, all of the energy efficiency and renewables programs have been eliminated or almost totally abandoned.

There has been an effort to have a bank all on the grounds that the free market will automatically move people into efficiency or the use of renewables.

The percentage of the total budget is substantially larger under the proposal of the administration than before. I guess the first question is, is, in fact, the policy that is placed by the administration really one that is consistent with ideology that is used to justify that policy?

Mr. LOVINS. We feel that most of the energy policy of this administration has favored, and increased subsidies, the costliest and most vulnerable sources, while putting impediments in the way of, and reducing support for, the cheapest and most resilient alternatives.

Mr. WOLPE. Can one argue free market if one is also supporting subsidies for renewables and energy efficiency?

For example, the Solar and Conservation Bank is a form of a subsidy to encourage more efficient energy usage.

Mr. LOVINS. We have the unfortunate situation that a free market does not exist. It requires, if you go back to the free market theory, things which, to start with, are impossible: perfect information, equitable access to capital, perfect competition, full use of all resources, and so forth.

So what we have is to begin with an imperfect free market—although clearly, in its own way, the best system anywhere in the world.

Given those imperfections, we then need to reduce them in order to move as close as possible to a free market.

If we are going to be subsidizing forms of energy, we ought to subsidize those which give us the most services per dollars invested, which give us the best hope of a future sustainable energy system per dollar invested and, in this case, which give us the greatest reduction of vulnerability per dollar invested.

We are not now doing that. This administration, as Amory said, is pushing precisely the technologies which make us more vulnerable, gives us the least energy per dollar invested, and does the least for small business and for innovation.

Mr. WOLPE. What would be your explanation of the inconsistency between the professed ideology and the policy which is in fact being implemented?

Mr. LOVINS. Corporate socialism. I feel there is a reluctance to permit the market to work if it will do in one's favorite technologies or if it will favor technologies that one isn't fond of.

This is, alas, a bipartisan phenomenon. We saw in the last administration support for a synthetic fuels program, even though it

was clear that the Nation would save more oil faster and cheaper by giving people free 40-plus-mile-a-gallon cars (which would be very good for Detroit and the UAW), provided that people getting those free cars would at the same time scrap their inefficient cars to get them forever off the road.

But this administration is, I think, even worse in not doing that kind of arithmetic and if it is going to subsidize anything, is not subsidizing the sources that will give the most energy and the most resilience per dollar.

Mr. WOLPE. The other question I want to pursue is the threat that is described here is academic versus a real threat. You referred in your testimony to, I think, over 20 States in the United States in which there has been at one time or another some form of attack on centralized distribution system or on energy supply.

Could you give some illustrations of specific instances in which energy systems in this country have already been subject to the kind of attack that represents the central concern here?

Mr. LOVINS. I can't give places and dates from memory but they are, indeed, all set out in our text. Many of our 1,200 references document exactly this sort of thing.

There have been explosions and other acts of sabotage caused at refineries and tank farms. A number of pipelines have been cut or blown up. Coal trains and bridges are blown up almost endemically in Appalachia in labor disputes.

In 1978, an American utility was bombed every 12 days, although that rate has since slackened.

And as Dr. Kupperman mentioned, many of those attacks were on local targets such as local distribution substations, but some of them were also on main transmission corridors and, indeed, we were close to calling out the National Guard in the Northwest some years ago when a couple living off in the woods dynamited something like 14 transmission towers.

There is, in fact, a sort of war going on right now in northern Minnesota in which conservative farmers, who feel that a major powerline was built across their land in an unjust fashion, have been shooting out insulators and knocking over towers at night. Despite great effort, it has been impossible to catch anyone who was responsible.

There are many motives for these attacks: some of that kind, trying to enforce some degree of responsiveness and justice in an institution; some pure malicious mischief we have had, for example, major pipeline input terminals that were so badly guarded that they were regularly burglarized by juveniles who would hold beer parties there at nite; a few well-designed extortion attempts that were stopped really by luck.

I think Mr. Heffernan's comments about trucking lend a very sharp point to Dr. Kupperman's remark that we mustn't look only at the energy system but also at communications, transport, and many other things, the water system, the food system.

We haul the average molecule of food in this country something like 1,300 miles before it gets eaten. And I expect that the more we look at the interdependent fragilities of centralizing many of our industries, the more we will find resiliency benefits in greater local self-reliance.

Mr. WOLPE. Thank you.

Mr. BEDELL. We should close pretty quickly here.

Did you have something you wanted to add, Mr. Heffernan?

Mr. HEFFERNAN. In response to the question about the free market, I think the subcommittee should be aware of the fact that there isn't really a free market in either oil or other energy supplies. Almost all the oil that is used in this country is moved under contract which restrains price and the same goes for other kinds of energy, so when the administration says we rely on a free market they can't really without serious legal problems just in the contractual area alone.

Mr. BEDELL. I have a short question or two.

Mr. Heffernan, you indicated that you tried to put in new efficiency standards for commercial and industrial plants in California and that the Federal Government was not cooperating with you.

Mr. HEFFERNAN. Actually this is in the appliance and the factory motor area. The Department of Energy and the White House I think, have recently signed an Executive order mandating "no standards" for energy efficiency and appliances.

The Executive order was written in such a way as to preempt State standards for appliances and motors.

Mr. BEDELL. Why would they do that?

Mr. HEFFERNAN. I think it is part of the regulatory reform effort, that I think is somewhat misplaced. We are going to have to wait and see. Maybe it will make appliances cheaper. We think it will make energy more expensive in the long run.

Mr. BEDELL. Mr. Lovins.

Mr. LOVINS. To give a specific example, Mr. Chairman. The best refrigerator on the market in this country uses about half as much electricity to do the same job as the average refrigerator; yet I understand that the manufacturer of this improved one had to resign from the Association of Home Appliance Manufacturers in order to support a Federal or State standard—which would, of course, favor its own product because the other manufacturers were opposed.

But meanwhile, Toshiba makes a refrigerator three times as good as our average, and the best prototype is 20 times as efficient as our average.

So I fear that we may be seeing the same thing happen to our domestic appliance manufacturer that happened to our carmakers.

We can see in retrospect that the efficiency standards for cars helped Detroit get a little headstart in catching up with the foreign competition but the appliance manufacturers don't seem to want that advantage for themselves. There as in photovoltaics we may again be losing to foreign manufacturers.

Mr. BEDELL. I am glad I asked the question.

Apparently you feel there is a serious problem in our whole appliance industry, that foreign producers may produce significantly more efficient appliances and end up taking over a larger part of the market than they otherwise would?

Mr. LOVINS. Yes; they are already making those appliances and many of those will be hitting our market later this year.

Mr. BEDELL. You say there are prototypes of refrigerators that would be 20 times better.

Mr. LOVINS. Yes. The best one that we are aware of uses only 5 percent of the energy.

Mr. BEDELL. Where do I buy one of those?

Mr. LOVINS. You can't buy it yet but I think in a few years you will be able to buy it from the Japanese if not from our own makers.

It is a very straightforward but very clever technology. In places that are cold in the winter, like Iowa or Massachusetts, one can also do a seasonal-storage icebox, which uses no electricity and therefore if the power is cut off your food won't spoil.

This is really a parable for the dramatic recent progress in technologies for wringing more work out of our energy. In that area and in renewable sources, solar cells most of all, many of our own manufacturers are being rather shortsighted and focusing on the first generation technologies that pay back very quickly while Japanese and other industries are taking a somewhat longer view and going straight for the second generation technologies.

Mr. BEDELL. Is this explained in your book?

Mr. LOVINS. Yes; and it is in those second-generation areas that most of the R. & D. cutbacks by this administration have occurred.

Mr. BEDELL. Is the explanation that Hunter gave us with regard to possible houses in Minnesota that wouldn't need any heat in your book?

Mr. LOVINS. Yes, sir.

Mr. BEDELL. You should tell me, where do I get your book?

Mr. LOVINS. It is published this Friday by Brick House in Andover, Mass., and I understand that the Sydney Kramer bookstore here in Washington should have it during this week.

Mr. BEDELL. Thank you.

Well, your testimony, has certainly been, I think, very enlightening to us, I appreciate very much all of you being here. Thank you very, very much.

Mrs. LOVINS. Thank you.

Mr. BEDELL. Our next panel consists of Herman Director, chief economist for the National Small Business Association, and David Pomerantz, director of the energy management project at the International City Management Association.

Mr. Director, you may proceed.

PANEL CONSISTING OF HERMAN DIRECTOR; AND DAVID POMERANTZ

TESTIMONY OF HERMAN DIRECTOR, CHIEF ECONOMIST, NATIONAL SMALL BUSINESS ASSOCIATION

Mr. DIRECTOR. Thank you very much, Mr. Chairman.

My name is Herman Director and I am chief economist for the National Small Business Association, a multi-industry trade association representing approximately 50,000 small business firms nationwide.

The United States is periodically affected by emergency energy shortages. This is a fact recognized by all branches of government, both legislative and administrative at national, State, and local levels.

These energy emergency situations may well continue and become more intensive in the future, affecting virtually all forms of business activities.

This includes energy resource production and distribution, transportation, wholesale and retail merchandise distribution, manufacturing and industrial production, as well as others.

Experience indicates that in periods of national emergency involving serious shortages, agencies of government put into effect previously prepared "standby" measures or develop new plans and procedures to cope with the situation. In either event, all businesses, large or small, are affected.

Large businesses with permanent staffs in Washington, D.C., maintain close contact with the Congress and administrative agencies. They are thus informed in detail regarding proposed actions and can protect their particular interests and prepare accordingly.

Small businesses, by far the larger number in terms of establishments and employment, are not similarly represented and must, therefore, rely on their respective trade associations for information and representation.

For this, NSB maintains surveillance and a direct channel of communication with its members and with Government.

NSB is a source of information and representation in emergency energy situations, to safeguard the needs of small business in terms of resource allocation and to protect their economic position in the business community.

Fuel and other energy resource allocation regulations largely ignore the very important role of small business in our economy and particularly its special problems. About 98 percent of all businesses in the United States are small.

With regard to defense preparedness, it should be understood that small business provides a wide variety of software and engineering services for essential government and business applications.

Market demands for highly precise, reliable, first-quality, machined parts and assemblies for the aerospace, communications, and ordnance industries are supplied by small business.

Innovative electromechanical and electronic devices for warning systems and electronic weapons originate with small businesses. Also from small businesses come telemetry components, oscillators, communication devices, and encoders.

In a survey conducted among NSB membership during a previous energy shortage, more than 600 members in the survey sample told NSB that they would be forced to cut back employment by 15 percent or more.

In addition, information given by NSB members as to the impact on them of the energy crisis and materials shortages is a strong case to Government for a fair allocation of energy and materials so as to maintain defense and essential civilian readiness and to minimize the impact on employment.

In the survey, members were requested to determine the impact of regulation governing the allocation of fuel as related to actual consumption in a previous base period record of consumption.

They were requested to give an estimate of the effect the shortages would have on their work force, or what percentage cutback in employment would result.

The following is the summary tabulation of estimated reductions in employment as reported by them: Construction, 28; manufacturing, 16; retail, 9; wholesale, 7; services, 14. Average cutback in employment was 24.

Unless the Federal energy offices and field staffs are mandated by regulations to give special attention to the problems of small business, then it is inevitable that small business will not be given fair and equitable treatment.

Standby mandatory petroleum allocation regulations deviate 180 degrees from the historical treatment of small business with respect to allocations.

Since World War II, Government regulations in this area have recognized, almost without exception, the unique position of small business.

Such regulations have included special provisions designed to protect small business to insure its continued participation as a force in our economy in times of emergency.

It has been standard practice to include set-asides for small business as well as self-certification statements of requirements. The current standby regulations contain no such safeguards for small business.

Because there are no set-asides or self-certification or similar types of procedures in existing regulations, recourse from the regulations may be only on an individual appeal to Federal energy offices on the basis of hardship.

If relief is given based upon satisfactory representation of hardship, it will only be on an interim basis for a 60-day period. As a practical matter, this means that a paperwork surplus will be added onto a fuel shortage.

Most regulations provide allocations in virtually all categories on a calendar year base or variation thereof. This practice ignores the small business unit which has grown in subsequent years.

Also eliminated from consideration are those businesses that are newly formed and therefore have no base for allocation. Businesses that have relocated also have no base period where allocations are made on a geographic regional basis.

Reporting procedures are generally much too detailed and cumbersome. Detailed reporting on a monthly basis is required from purchasers and suppliers including calculation of base periods.

More careful consideration to the needs of small business is imperative in the interest of defense preparedness.

Thank you for giving us the opportunity to present our view on this issue which is of such importance to the small business community.

Mr. BEDELL. Thank you, Mr. Director.

Mr. Pomerantz.

TESTIMONY OF DAVID POMERANTZ, DIRECTOR, ENERGY PROGRAM, INTERNATIONAL CITY MANAGEMENT ASSOCIATION

Mr. POMERANTZ. Thank you, Mr. Chairman.

I am here today in my role as director of the energy program at the International City Management Association.

Prior to joining ICMA, I was director of the Franklin County energy project, a community-based energy transition project in western Massachusetts.

There are several points I would like to discuss with you today concerning energy vulnerability and local responses to actual or perceived energy problems:

Those points are:

How have communities identified vulnerability issues and moved to address them?

What have been the impacts of local energy programs?

What are the barriers and problems, both historical and current, affecting community energy management?

Since the first oil embargo in 1973, and the subsequent natural gas and petroleum problems in the late seventies, supply problems and energy cost increases have led to increased awareness in the general public about energy.

Today, almost 10 years after the first oil shortage, progress has been made in understanding the relationship between energy and the way this society functions.

We have taken steps to conserve energy, and are exploring the development of new energy supplies.

As this country has lurched from one energy supply shortfall to another, and has had to endure increasing energy prices, volumes of information and studies have been published concerning appropriate solutions to energy problems.

It turns out that back in the fifties some people were throwing cautionary notes to the wind about potential energy vulnerability.

In 1956, the year President Eisenhower signed the National Expressway Act, several studies were released stating that domestic oil production would peak in the early seventies—the former Energy Research and Development Administration verified this in a study done in 1975.

History now shows that cities, industry, and transportation networks were developed without taking this information into consideration. Based on past experience, you almost have to wonder if all the current studies are causing an energy information overload.

I am not an engineer, and cannot recite to you the processes involved in the production of steam and electricity by cogeneration, or the steps involved in the construction of coal slurry pipelines.

But the technical aspects of energy production are not what are critical to the discussion of energy vulnerability. What I have learned in 5 years in this field is that energy and the resolution of energy problems are social and institutional issues, to which are attached technical questions.

The energy system that this country has operated, benefited, and suffered under came about as a result of political and social decisions.

Today, there are segments of society who want to continue the energy system that has existed for some 40 to 50 years.

At the same time, there is a growing movement made up of individuals, businesses, and Government officials who were never involved in the energy game before except to pay the bills, but due to

perceived or actual energy vulnerability on their part, have decided to take steps to address cost and supply related energy problems.

Today, energy can be looked at from a micro and macro perspective, both in terms of what problems exist, and where action is taking place.

The macrolevel is characterized by debate over what are energy problems, the release of different studies, and numerous energy policy and program changes as administrations come and go.

At the microlevel, energy management is being practiced in homes, offices, and local governments as people move primarily to address energy costs.

Since 1973, there has been fluctuating, yet definite upward movement on the energy management learning curve. There is a saying that institutions embrace new ideas slower than people, and energy may be a good example of this.

Experience has now demonstrated that conservation works—it reduces overall consumption, lowers energy bills, and helps stretch existing supplies.

Perhaps the ultimate testimony to conservation comes from a number of electric utilities who have realized that, at this time, load management and other forms of conservation make better sense than increasing generating capacity.

Conservation includes both no-cost behavioral and/or operational changes, as well as capital expenditures for new energy efficient equipment that will save energy or produce it.

In some cases, those improvements have been made because of the existence of programs such as the institutional buildings, schools, and hospitals grant program, State and Federal tax credits for conservation and solar equipment, or because of energy audits and loans offered by utilities under the residential conservation service.

Local governments have moved to address energy at two levels. First, they have taken steps to quickly control energy costs as they have affected budgets and the delivery of services.

The International City Management Association conducted an energy management assessment in 1980. Of the 1,550 cities and counties responding, 60 percent said that energy costs constituted the second highest line item in their operating budgets following personnel.

In the same survey, over 90 percent said they were taking action to control energy costs and guarantee the delivery of services.

The need to address costs and maintain service levels translates into programs. For example, in El Paso, Tex., an energy data collection system and retrofit program for public buildings has been in existence since 1977.

A sampling of energy management activities in municipal service areas is provided in the testimony submitted for the record.

The second level local governments are addressing energy as relates to the overall communities they govern. A key area of energy management that is critical to both local government and the community, and to the issues being discussed at this hearing, is contingency planning.

A number of local governments, including Dade County, Fla., and Pasadena, Calif., have developed emergency plans that specify

how service levels will be reduced if energy supplies drop by various amounts.

Some local governments, in cooperation with other segments of the community, have formulated plans that cover energy emergencies in the entire community.

For example, Hennepin County, Minn., and Austin, Tex., are two communities that have worked with various sectors within the community to develop communitywide contingency plans. They have yet to have to implement them and there are some questions about how effective they would be.

Another way local governments are trying to hedge their bets against energy emergencies is by stockpiling fuel, and by entering into bulk purchasing agreements with other communities. This practice has been used in a number of States, including Massachusetts.

As community energy management has evolved, it has become more sophisticated. For local governments, there has been a growing recognition that they can help shape energy use in the overall community through the regulatory tools and powers they have.

A number of communities including Windsor, Conn., and Lincoln, Nebr., have modified their zoning ordinances and subdivision regulations in order to foster more energy efficient development.

Other examples of communitywide efforts can be found in Baltimore, Md., and Wichita, Kans., where conservation loan programs have been developed to help homeowners conserve energy.

Another vein communities have begun to explore concerns how energy management can be integrated with traditional community and economic development programs.

Block grant funds are being used to make energy conservation improvements as part of housing rehabilitation efforts, and some communities have begun to examine the potentials for energy production using technologies such as photovoltaics, wind, hydroelectric, resource recovery, and district heating.

Piqua, Ohio, Cambridge, Mass., and Trenton, N.J., are in the process of developing or expanding district heating systems in their downtown areas.

In each case, the energy systems will be used as an incentive for economic development .

A striking example of how far community energy management can go is occuring in St. Paul, Minn. A new industrial park is being developed, and includes a district heating and cogeneration system.

Passive solar housing will also be constructed for the people who will work at the park. Financing is through a public-private partnership with urban development action grant funds being used to leverage private money.

Conservation efforts made at the community level during the past 9 years have definitely helped the Nation's energy security.

The majority of programs that have been implemented by communities have been self-initiated, have used local resources for the most part, and have served to primarily address cost-related energy issues.

The ways in which energy management programs were developed were based on the different actors who got involved, internal

as well as external barriers and problems that had to be overcome, and the overall dynamics at work in a particular community.

A number of issues will continue to affect the resolution of community energy issues, and the resulting lessening of national energy vulnerability.

Some of those issues are:

The state of the economy;

New and refined energy technologies that are brought onto the market;

Institutional changes that can spur energy management; for example, solar and conservation tax credits, grant and demonstration programs, the Public Utilities Regulatory Policies Act;

Financing; and

Having the correct information and building support that Mr. Lovins alluded to in his testimony.

Energy emergencies that have occurred have clearly showed that local governments are the entities that are looked to for solutions when there are problems.

During the gasoline shortages in 1979, many local governments, including Washington, D.C., had to develop emergency response plans.

If decentralization is to truly be an effective alternative to the energy vulnerability issues raised here today, there will need to be a concerted effort at all levels, public and private, to help communities move beyond conservation and into supply development.

Supply development is much further back on the learning curve I mentioned before. The majority of supply-oriented projects that have been initiated to date have mostly encompassed feasibility assessments.

While a number of resource recovery, cogeneration, hydroelectric, and wind projects are producing energy, the amounts are small and are primarily helping individual buildings or people.

As Mrs. Lovins said, we have about 7 percent of our resources now being provided by renewables in this country. To move beyond this, a tremendous capacity building effort with demonstration projects will be required.

To the extent that local governments have a role to play in protecting the country from energy supply vulnerability, there has not been a concerted national effort to increase the capacity and ability for local governments to assume control over their communities' energy destiny.

Thank you.

Mr. BEDELL. Thank you, Mr. Pomerantz.

Mr. POMERANTZ. This is a poster that ironically was funded by the Department of Energy that looks at some of the existing vulnerability issues that are affecting energy at the community level and also some of the things that are going on at community levels that help rectify and deal with some of the problems.

Those are available, I assume, from the Department of Energy as well as the National Council of Churches which is one of the groups helping out in these projects.

You can see across the top some of the issues that were talked about by some of the previous witnesses and the bottom two-thirds of the poster shows some of the community-oriented efforts that

are being made for both conversation, food production, transportation, and supply development where people are living.

The poster was done by a woman from Oregon.

Mr. BEDELL. The previous witnesses have indicated that if there were a disruption, for example, of the energy supplies to New York City, it would perhaps be a disaster that could go on not just for days but actually weeks or months, and the city would not be prepared to handle it at all.

Under those circumstances, what sort of planning can a city do?

Mr. POMERANTZ. Most local governments make the definition, and are first of all concerned with their own operations. What can they do to keep police, fire, sanitation, and essential services like that on the road.

How can they keep their service levels up? Some communities that we have looked at have developed plans that will look at supply disruptions and reductions in supply levels ranging from 5 to 40 percent and how they will have to reduce their service levels according to whatever supply disruptions occur.

That is all well and good on a short-term basis. If, let's say, New York City was facing a much more long-term problem, you start running into issues about fuel supplies still coming into New York City even to keep services on the road.

For example, even if the New York City government had a contingency plan and they implement it, it is unclear how long those fuel supplies would be available if the disaster was major enough.

There may be only so many days that they could keep police and fire apparatuses on the road. In terms of the broader community, it is much more hazy at this point in terms of exactly what local governments can do to try to guarantee or minimize the impacts of shortfalls or cutbacks that occur in a city.

It is not just fuels. It is electricity as we heard this morning as well. Where the local governments are now in terms of developing plans for the broader community is just in terms of passing out information, making people aware that this might happen and these are some of the things we might have to get into.

The closest local governments have come to having to deal with these situations is with winter heating emergencies where they had to move low-income and elderly people out of their homes and into schools.

But in even a small community we haven't seen a major disaster yet and it is not clear how effective the local government or anybody could be in terms of dealing with that problem.

Mr. BEDELL. I presume your answer is that we are better off to plan as best we can, that we will be better off than we would be with no plans, even though it might be an extremely difficult situation?

Mr. POMERANTZ. That is right.

I firmly support the notion of having a plan in the bottom drawer and some kind of exercises to see how well you can implement that plan.

Mr. BEDELL. Mr. Director, you have been involved in Government planning; is that correct?

Mr. DIRECTOR. Yes.

Mr. BEDELL. Tell us about it.

Mr. DIRECTOR. Well, I came to Washington, or I should say I was sent to Washington, by a man named Richard Daley, in Chicago many years ago. I had just graduated from the University of Chicago and was working as an efficiency expert for Richard Daley in Chicago and he called me in one day and said, "Herman, you have to go to Washington," and I said, "Why?"

And he read me a telegram and the telegram was addressed to Daley as well as others and it said:

> Send me all your bright young men; we are getting into war. We are getting ready for a war. We don't know how to do anything. We don't know how to make anything. Send me your bright young men immediately.

And I said, "What if I don't go?" He said, "If you don't go you get drafted."

I came to Washington and became the Director of Systems Planning for the War Production Board. Of course, I got drafted after awhile anyway.

The interesting thing is that this was the first exercise in planning. I worked in the War Production Board and then I went off to the war and served in the Pacific for many years with the Occupation Forces in Korea and Japan.

When I was sent to the east coast of Korea to work with the Russians at the 38th parallel, we also had to look over the energy facilities for Korea. One of the things the Japanese had done there was rather than simply build powerplants and move coal up to the powerplants and move all sorts of heavy things in, what they did was they built their powerplants at the mine and they transmitted the electric power, rather than the coal because Korea is full of coal. It is rich with coal.

To give you another indication of how they acted to conserve their energy, they needed hard coal for their steel mills in Japan and hard coal in Korea was on the east coast of Korea.

The mines looked like our new Metro stations here with the big circular roofs all set in concrete and so on. They, the Japanese, brought their ships into the harbor alongside the coal mines. They pulverized the hard coal into a powder in the mine. They vacuumed it into the ships.

The ship went to Japan and pulled into the harbor next to the steel mill in Japan. The coal was fed directly into the steel mill. When the ship was empty it went back to Korea.

The same on the west side of Korea where they had the coal. They built the powerplants in Yongwol and they shipped the power. The same way with the coal in North Korea.

Later, I came back and worked in the State Department on the Marshall plan and the planning for redoing the Southeast area, and we found out we were no longer prepared when the Korean conflict came up so we had to do a planning exercise for the Korean conflict. What we did there, again, was to recruit the businessmen to act as advisers and we went through that exercise.

Then the Korean conflict was over. We found we were not prepared for the Southeast Asia war so we had to begin calling in businessmen to reactivate our training program. We found that after a period of time we were capable of handling that situation to some extent.

In 1951, we started the National Defense Executive Reserve which is made up of volunteer businessmen who are specifically trained for particular jobs in an emergency, whether it is an energy emergency, or earthquake emergency, or some other kind of an emergency.

This is the sort of thing that we are supposed to be prepared for. That has run pretty well down. It is not as effective as it could be. It was at one time 4,000 industry people who were trained and knew their assignments and it is now down to about 2,000.

We still carry cards, Federal emergency cards. I have one here, a card which says, "Post Attack Responsibilities." There are only 2,000 of us left and many are a little out of tune. There has been very little effort in previous administrations, and in this administration, to build it up to its necessary level.

I think that is one of the things that must be done.

So this will sort of answer your question.

Incidentally, one of the things that has come up, when there was, for example, an earthquake in the northwest United States the electric power was cut off and the steel mills only had a certain amount they could produce of steel. So Kaiser Steel decided they weren't going to ship any steel past the mountains.

Now, the customers of Kaiser who were past the mountains had to find other sources of supply. The Government had come out in the meantime and said that the steel mills who had steel would have to allocate their steel on a base period based on previous records of purchases by the businesses from that steel mill.

We have many small businesses beyond the mountains who were Kaiser customers who knew that there was a United States Steel plant or warehouse that could sell them steel but they had no base period with United States Steel so you couldn't get any steel.

We had to go into a laborious procedure to have a base period established for this particular group. Now, nothing has been done to overcome that sort of an obstacle.

I think that this hearing and your work with the Small Business Committee can be very, very helpful in that respect.

Mr. BEDELL. You represent a national small business organization, you have been involved in planning. How do you see the small business segment of our society relating to possible disruptions in our energy supply both as to how it would affect them and, second, as to how they might contribute towards minimizing the problem?

Mr. DIRECTOR. It has a direct and immediate effect on small business because depending on the kind of energy they use, whether they use gas energy or petroleum energy or some other fossil source and if they are part of a large line that is disrupted and there is no source available they have no alterntaive except possibly to shut down.

If they use fossil fuels and there are other sources or temporary sources they might, with the help of Government regulations, as I indicated before, get some minimum sources.

Now, it is difficult for small business to develop the alternate sources. They do not have the resources to stockpile or inventory large supplies so that it requires that they get immediate accessibility to any available source that they can have and this would require Government assistance directly.

Mr. BEDELL. Thank you very much. We appreciate your testimony very much and appreciate both of you coming.

Minority counsel has a question.

Mr. KULIKOWSKI. Could I direct a couple of questions to Mr. Pomerantz?

Mr. BEDELL. Surely.

Mr. KULIKOWSKI. It strikes me that there are a couple of areas in which communities are being asked to plan for energy emergencies, and those instances are perhaps the most difficult of all to plan for. First is the case of a nuclear powerplant when an accident occurs or sabotage happens, and the requirement that those nuclear power plants do some planning as to what to do in emergencies.

The first question is how local communities interface with that kind of planning by nuclear powerplants and what kind of planning has been done by local communities in that situation.

Mr. POMERANTZ. There are a number of communities who within a close proximity to nuclear reactors have taken it upon themselves to try to develop plans and to work with both the utilities in the State health departments.

The key problem that they have had is access to information. We keep coming back to this access to information question or problems. There have been a number of incidents, the latest one in the nuclear station outside of Rochester in upstate New York where neither the State nor the communities in the surrounding area were either given any information or the right information in the time period that was required.

It didn't get to the point where they had to evacuate anybody or make any crucial decisions, but had that happened, people would have been unprepared at the local level.

There have been a number of studies that have been done. In Massachusetts, one State as an example, that looked at the relationship that existed between State entities, local governments, utility officials in terms of some sort of coordinated approach to nuclear evacuation planning or nuclear reactor planning.

In most cases the bottom line of those studies was that, again, you could develop the plan at the local level and you could try to run some exercises and see if you could not so much move people, but run the communications systems effectively, and that is another whole area where there is some concern about both redundancy in systems.

Let's say there was a blizzard and a system went down. How could you notify people at 3 o'clock in the morning. The bottom line in most of the studies was that you can't guarantee that key actors who have to first get the information out to do it are going to do it when the whistle blows.

In most cases where they have taken the opportunity to develop these plans, they are not sure they could get the people out of the communities but they are not sure if they are going to be plugged into the loop fast enough to make some of the decisions that have to be made.

Mr. KULIKOWSKI. You alluded to the other situation where the communities have to do some planning, which is the current nuclear evacuation plan currently being formulated.

FEMA, I am sure, has a role in those plans. My understanding is that in many situations it is the State which decides whether individuals get evacuated and basically dumps those individuals into the local communities and leaves the local communities to figure out what to do with the evacuees who have come in from large urban areas.

Is that an area in which you have been involved?

Mr. POMERANTZ. Not of late.

When I talk about the energy management work that we have been doing, it is primarily based in terms of helping local governments and the communities that they govern move in the areas of efficiency, improvements, conservation, and the development of new supplies, ways in which they can advance those two areas in terms of decreasing their energy vulnerability at the local level.

Mr. KULIKOWSKI. Thank you.

Mr. BEDELL. Thank you. And, again, we thank all our witnesses for being here this morning.

[Whereupon, at 11:50 a.m., the subcommittee adjourned, to reconvene subject to call of the Chair.]

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